GUIDE TO THE

FORTY-SEVENTH FIELD CONFERENCE

of the

OHIO ACADEMY OF SCIENCE

April 22, 1972

UPPER PALEOZOIC SEDIMENTARY ROCKS IN THE VICINITY OF THE BURNING SPRINGS ANTICLINE, WEST VIRGINIA AND OHIO

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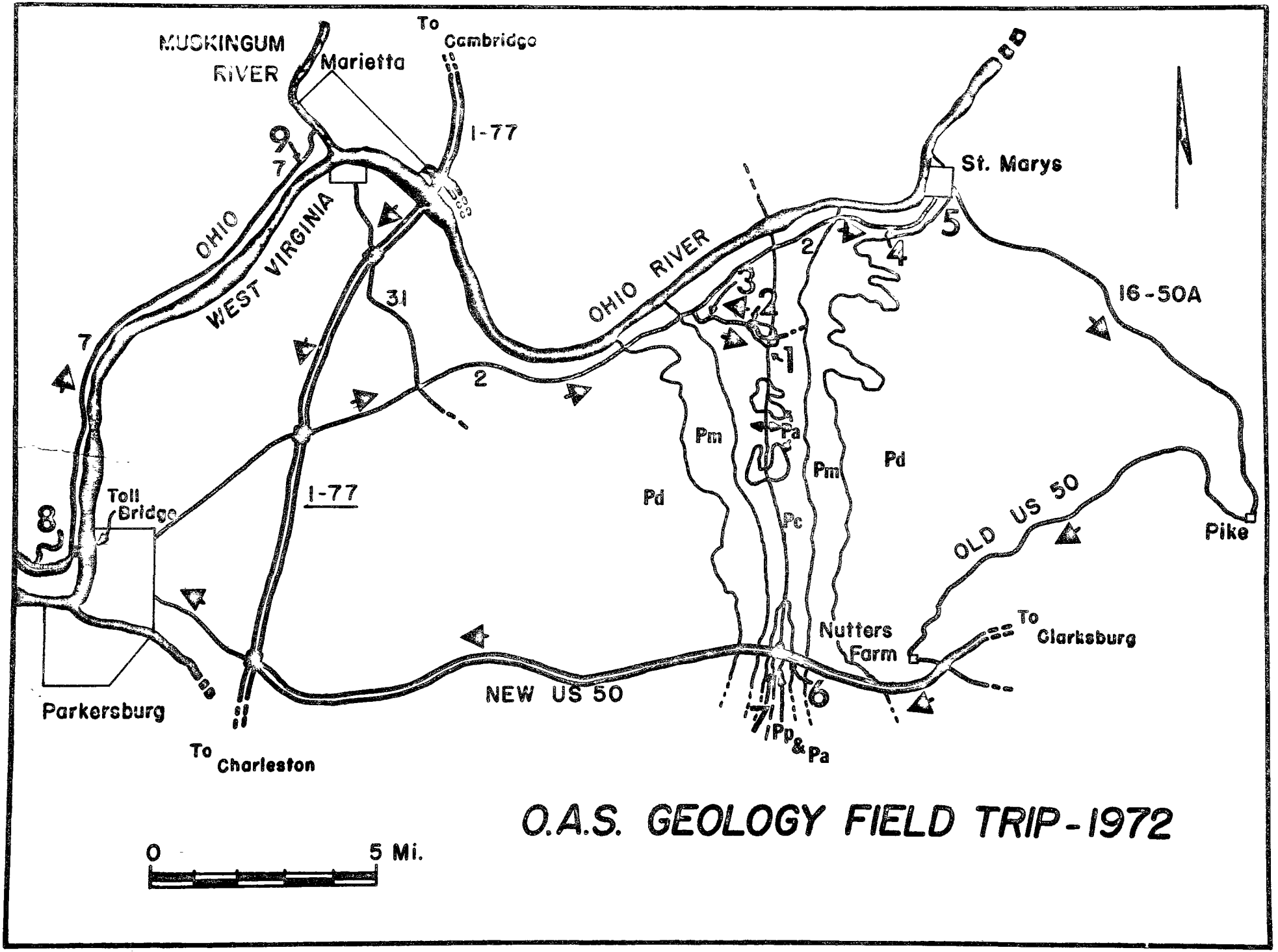
MUSKINGUM RIVER
Marietta
To Cambridge
I-77
OHIO
WEST VIRGINIA
OHIO RIVER
St. Marys
16-50A
Toll Bridge
I-77
Pm
Pa
Pd
Pc
OLD US 50
Pike
Nutters Farm
To Clarksburg
NEW US 50
Parkersburg
To Charleston
Pp & Pa
O.A.S. GEOLOGY FIELD TRIP - 1972
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5 Mi.

The Marietta area is near the middle of a rather enormous synclinal region called the Allegheny Synclinorium. The western flank of the very low dipping structure is shared by the Cincinnati Arch that extends in a north-south direction through Cincinnati, Ohio, and the eastern flank occupies much of West Virginia west of the Valley and Ridge Province. The axial trace or symmetry line lies a few miles east of Marietta and extends in a southwest direction from Pennsylvania into Kentucky. The synclinorium has several smaller synclines and anticlines, but the only one we will examine is the Burning Springs Anticline, also called the Eureka Anticline, Volcano Anticline, and the Newell Run Uplift. This anticline starts a few miles east of Marietta and extends from Ohio almost due south into West Virginia for a distance of about 40 miles. The width of the anticline varies from about two to three miles and at some localities has a broad crest consisting of nearly horizontal beds. Dips vary considerably but at some localities are over 70 degrees. The slightly asymmetrical structure generally has higher dips on the western flank, especially along the new highway 50 exposures. The structural relief is about 1,600 feet. Numerous eastward dipping thrust faults are present in the subsurface and most are located about 5,000 feet below the crest. These faults are prominent in the Lower Devonian and Silurian formations. It is possible that a large block of Silurian through Permian rock was shoved westward a fraction of a mile along Silurian salt beds. The anticline is a surface expression of the thrusts. The precise geologic date of the thrusting and the development of the anticline is unknown, but the structures are probably directly related to the prominent folds and thrusts of the Valley and Ridge Province. The Appalachian Orogeny that formed these features occurred during the Permian or Triassic periods. Prior to the development of the major structures the anticline was perhaps a positive element during the Devonian and Pennsylvanian periods which affected the deposition of sediments.

Numerous oil wells are located on the anticline and the oldest was drilled in 1860. For several years most of the wells were shallow and only penetrated the sandstones of the Pennsylvanian Conemaugh Formation. The Cow Run or Saltsburg Sandstone was a major producer. Most of the wells drilled in the 1900's extend into the Mississippian or older rocks.

Major rock-stratigraphic units pertaining to this trip are, from oldest to youngest, the Pennsylvanian Pottsville, Allegheny, Conemaugh, and Monongahela Formations, and the Washington Formation of the Dunkard Group (Pennsylvanian and

Permian). The four older units are given group or series status by some workers. Their boundaries are generally based on important bituminous coal beds. All are divided into members or are informally named (such as the terms Upper or Lower in front of a geographic term). Both subdivisions are considered as members in this guide. Member terminology differs slightly from state to state and most of the names in this report were obtained from Cross and Schemel (1956).

The following major sedimentary rock types are found in the exposures we will examine: conglomerate, sandstone, shales, limestone and coal. The three detrital rocks form most of the deltaic deposits of the Pennsylvanian and Permian formations near Marietta. The vast deltas that spread north and northwest can be divided into more specific regions such as stream, floodplain, lake, swamp, beach, bay, lagoon, offshore bar, and open sea or marine environments. It is not always possible to determine the environment of deposits by merely examining a single section of a rock in a road or stream cut as 99.99+% of the rock unit is covered. The lateral extent and associated layers must also be considered.

Most geologists believe the majority of conglomerates and sandstones were deposited by streams. These rocks are typically impure, poorly sorted, cross-bedded units that have undulatory erosional bases and generally lack fossils, although some contain plant or bone fragments. Some of these rocks may be beach or offshore bar deposits which would usually be associated with marine beds.

The term shale is used in this road guide in a very broad sense for the silt and clay rich rocks that could be more correctly classified as being siltstones, claystones or mudstones. Most of the shales, especially in the thick nonmarine sections, are interpreted as being primarily floodplain accumulations. These rocks are found in direct association with stream deposited sandstones and have a variety of colors. Many contain carbonized leaves. Some found adjacent to lake limestones are either lake or floodplain deposits. The presence of ostracods and small pelecypods and gastropods would indicate deposition in a lake. The bay, lagoon, and open marine shale deposits are more difficult to separate as all can have marine fossils.

The environmental significance of limestone is easier to determine. The marine limestones generally have fossils such as foraminifera, horn corals, bryozoa, articulate brachiopods, cephalopods, ornamented ostracods, crinoids,

and conodonts. The same fauna may also be found in the associated marine shales. Fresh water or lake limestones would not have the fossils listed above and when fossils are present they consist chiefly of the small coiled shells of the annelid Spirorbis, small pelecypods and gastropods, and many unornamented or smooth ostracods. Most of the lake limestones you will see on the trip are brecciated or nodular.

The bituminous coals accumulated in swamps on the extensive floodplains or in low-lying swampy regions adjacent to the shallow marine environment. Some of the coals directly associated with marine shales or limestones represent the latter environment.

ROAD LOG

Cum. mileage		
0.0	0.0	Leave the Marietta College parking lot at the corner of Fourth and Butler Streets and turn left on Fourth Street.
.2	.2	Turn left on highway 50-A at the light and keep in the right lane.
.4	.2	The right lane curves to the right at the traffic lights on 50-A.
1.3	.9	Turn into right lane and onto Interstate 77 South towards Parkersburg.
1.8	.5	Cross the Ohio River and enter West Virginia.
2.5	.7	Exposures of the Pennsylvanian-Permian Dunkard Group with stream deposited cross-bedded red-brown, tan, yellow, and green sandstone, and predominately floodplain deposited red-brown shales and siltstones. Essentially horizontal rocks of the Dunkard Group are exposed for the next 17 miles.
6.9	4.4	Many small recent slump blocks are developed in red-brown shale on the left side of I-77.
7.4	.5	The high slope on the right side of I-77 has an exposure of yellow-brown Dunkard stream deposited sandstone with two dark brown sandstone concretions. Each of the oval iron rich concretions is about five feet long.
8.2	.8	Cross-bedded gray Dunkard sandstones are exposed on both sides of

		the Interstate. Cut-and-fill structures are prominent.
8.7	.5	On the right side of a road that parallels I-77 there is a thick stream deposited Dunkard sandstone that pinches out as it is traced southward along the exposure.
8.9	.2	Use the right exit lane (Emerson Ave. Exit).
9.3	.4	Stop and turn left on highway 2.
12.6	3.3	Junction of highways 2 and 31. Proceed straight ahead on highway 2.
13.9	1.3	Descend a hill onto the margin of the Ohio River floodplain.
15.9	2.0	Enter Pleasants County.
17.8	1.9	Numerous recent slides in the Dunkard Group and overlying soil to the right.
19.2	1.4	The dipping sandstones and shales on the right side of the highway are on the western flank of the Burning Springs Anticline.
19.7	.5	American Cyanamid-Willow Island Plant on the left. Turn right at the flashing yellow light onto Schultz Road. Pass tilted strata of the Conemaugh and Allegheny Formations. These will be examined on the return trip.
21.8	2.1	Turn right onto a narrow road.
22.0	.2	STOP 1 - Park near the red barn on the farm of Theodore Parsons. Walk southwest past the bass and frog pond along Sled Run for 0.2 of a mile to the first bend in the creek.

Exposures in the bed of Sled Run show the Pennsylvanian marine Brush Creek Limestone Member of the Conemaugh Formation, which is composed primarily of black shale with several large concretionary masses of black limestone. A row of small brown ironstone concretions is located on the eastern bank. The underlying Brush Creek Coal is exposed around the southern bend of the creek. The beds are about one-half a mile east of the axial trace of the Burning Springs Anticline and strike parallel to the creek for a distance of over 100 feet. The Brush Creek black shales, large limestone masses, and ironstone concretions have many fossils, and most are mollusks. The gastropods from this site, listed in approximate decreasing order of abundance, are: Trepospira, Glabrocingulum, Euphemites, Bellerophon (Pharkidonotus), Straparolus, Knightites (Cymatospira), Meekospira, Knightites (Retispira), Ianthinopsis,

and Shansiella. Most of the pelecypods are small and the most common one is Astartella. Coiled nautiloids (Metacoceras) and unidentified straight nautiloids may be seen in the rocks but are difficult to extract owing to their fragile shells. Brachiopods are not as abundant as mollusks and include Crurithyris and a few productids. Small horn corals (Lophophyllidium or Stereostylus) are more plentiful in some of the limestone masses near the south end of the exposure. Many of the fossils have white calcite skeletons that may be easily removed from their internal molds by jiggling the specimens in a box or collecting bag. The specimens should therefore be wrapped in newspapers.

22.2 .2 Return to Schultz Road and turn left.

22.7 .5 STOP 2 - Park beyond the roadside exposure of sandstone.

Rocks exposed on the north side of the road represent a small portion of the Allegheny Formation which extends along the road for a distance of about a mile. The Allegheny is spottily exposed near the axial trace of the Burning Springs Anticline in the northern part of the structure, and is overlain by rocks of the Conemaugh Formation. The rocks dip about 5° NE. The upper unit is the Upper Freeport Sandstone which is somewhat typical of stream deposited sediments. Cross-bedding and small cut-and-fill structures are apparent. The sandstone or subgraywacke has a dirty appearance owing to a variety of grains such as quartz, muscovite and rock fragments. Sorting is poor with silts and clays occupying much of the space between the sand grains. Both rounded and angular particles are present. The undulatory erosional base of the sandstone is also typical of many ancient stream deposits. Note that the stream cuts through the underlying Lower Freeport Coal at a few sites. Efflorescent minerals develop on the surface of the 1-1$\frac{1}{2}$ ft. bituminous coal, but are easily removed during a rainstorm. The yellow fluffy soft mineral is copiapite, $Fe_4(OH)_2(SO_4)_5 \cdot 18\ H_2O$, and the white mineral is probably a mixture of halotrichite, $FeSO_4 \cdot Al_2(SO_4)_3 \cdot 22\ H_2O$, and pickeringite $MgSO_4 \cdot Al_2(SO_4)_3 \cdot 22\ H_2O$ (Nuhfer, 1972). Honeycomb weathering is

well developed on some of the sandstone. A small thrust fault located on the western end of the exposure cuts through the Lower Freeport Coal and the Upper Freeport Sandstone. Partially cemented, brecciated fragments of the Upper Freeport are present along parts of the thrust plane. The apparent heave along the low angle fault is about 22 ft. and the throw is about 3 ft.

22.9 .2 An open rectangular grave is located on the right slope, but is partially obscured by the trees. According to Shockey (1954) the grave was carved from a large boulder of Upper Freeport Sandstone during the Civil War days by slaves. Unfortunately the man for whom the grave was started expired before the tomb could be properly prepared.

23.9 1.0 STOP 3 - Park on the right side of the road just past the crest of the hill.

These tilted rocks, on the western flank of the Burning Springs Anticline, represent the middle portion of the Pennsylvanian Conemaugh Formation. The stratigraphic section of the exposure is as follows:

shale, arenaceous, yellow	6+ ft.
Ames Limestone - marine, gray crinoidal limestone bed up to 2 ft. thick and associated gray, green, yellow, brown, soft shale. Fossils are abundant in some of the shales and include brachiopods (Neochonetes predominate, Productids, Neospirifer, Derbyia), pelecypods (small pectens and large Myalina), coiled nautiloids (Metacoceras), crinoid stem plates, bryozoa, and fish parts. Foraminifera are present in a few layers. Baird (1957) described a small piece of the dorsal spine of a shark from this site.	4 ft.
Lower Grafton Sandstone - cross-bedded gray sandstone.	6 ft.
Shale, gray with carbonized plant fragments in the upper part	7 ft.
Harlem coal - bituminous, impure	5 in.
Pittsburgh Redbeds - gray, brown soft shale with limestone nodules	17 ft.
Ewing Limestone - fresh water, gray, brecciated limestone with greenish-gray shale partings. Fossils are not abundant but include the annelid Spirorbis, small pelecypods and gastropods, along with some fish parts. The Ewing increases in thickness northward where it is quarried near Caldwell and McConnelsville, Ohio	3 ft.
Pittsburgh Redbeds - brown to greenish-gray shale and siltstone with some nodular limestone.	20 ft.

Saltsburg (or Cow Run) Sandstone - gray cross-bedded sandstone with sandy shale beds. 20+ft.

A similar section on highway 50 (STOP 6) lacks the distinct Ewing Limestone unit.

24.3 .4 Stop and turn right onto highway 2.

26.3 2.0 Belmont, West Virginia. The Ohio River is on your left, or you are going the wrong way.

29.1 2.8 STOP 4 - Park on Greensrun Road and examine the exposures along highway 2. EXTREME CAUTION MUST BE TAKEN AT THIS SITE OWING TO THE LARGE NUMBER OF VEHICLES THAT SPEED ALONG THE HIGHWAY.

The sedimentary rocks are on the eastern flank of the Burning Springs Anticline and dip about 3° S 74° E. The Monongahela-Conemaugh content is indistinct owing to the lack of a thick Pittsburgh Coal section, but is perhaps located above the sandstone with prominent ball-and-pillow structures. The measured units start near the crest of the eastern hill and extend westward along the highway (adapted from the Ohio Geol. Survey section 6638 and page 66 of Cross and Schemal, 1956).

Upper Sewickley Sandstone - gray coarse grained micaceous cross-bedded sandstone that forms a cliff. A sandy gray to tan shale is located 1/3 of the way up the section. The base is very uneven and cuts into the underlying units up to about 3 ft. 25+ft.

Sewickley Coal (Meigs Creek Coal in Ohio) - bituminous - 2 ft., in association with black to gray shale 6 ft.

Shale, gray to brown with much iron concentration 11 ft.

Lower Sewickley Sandstone - gray sandstone beds that are micaceous and thinly laminated, with interbedded red-brown to gray shales that contain carbonized plants 35 ft.

Fishpot Coal - trace in association with gray to black shale

Fishpot Limestone - gray calcareous shale with gray impure limestone nodules 1-3 inches in diameter 7 ft.

Redstone Sandstone - blue green to gray micaceous and red, green, gray shale 33 ft.

Redstone Coal interval - black, red, green shale 1 ft.

Redstone Limestone - fresh water gray nodular limestone with interbedded gray shales. The unit decreases in thickness as the underlying units pinch out in a westward direction along the exposure. Some of the lacustrine shales higher on the slope contain abundant ostracods and pelecypods. 11 ft.

Upper Pittsburgh Sandstone - gray to brown cross-bedded micaceous sandstone. The thickness is variable. Some of the large blocks that have recently fallen 20 ft.

from the cliff have parting lineations that indicate the general direction of current flow. Some are probably from sandstone higher in the section.

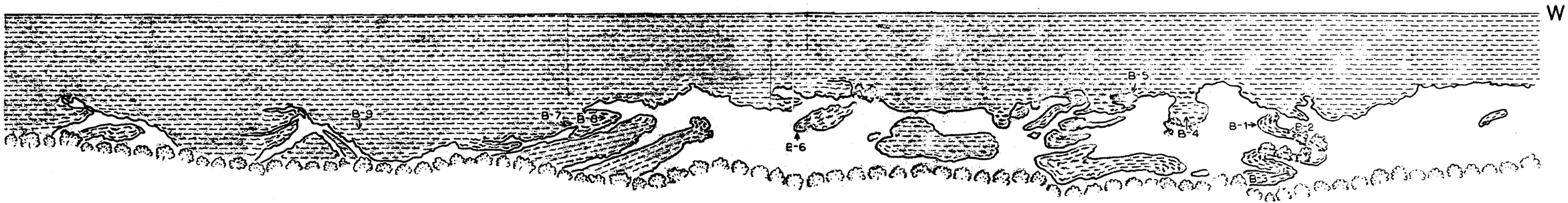
Ball-and-pillow structures (also known as flow casts, flow rolls, and by many additional terms) occur at the base of the Upper Pittsburgh Sandstone and within the underlying gray to green shale that is 10+ feet thick. The circular pillow-like or irregular masses of sandstone have distinct laminae that curve usually parallel with their outer margins. Some laminae, however, are arranged in S-shaped folds. Although these masses of sandstone have been called concretions, or products of spheroidal weathering, their origin is fairly well known as similar features can be produced in the laboratory. During Pennsylvanian time muds were probably deposited on a floodplain and were then covered by the fluvial or stream sands of the Upper Pittsburgh. Perhaps some of the overlying units were also deposited. An earthquake, which occurred prior to the cementation of the muds and sands, agitated the muds, thus making them act as a fluid (thixotropy). A portion of the overlying sands quickly moved downward into the fluid. Some sands became detached and settled several feet below the original mud-sand contact while other masses were still connected to the parent materials. The disturbance only affected the basal portion of the sand and the upper part reveals normal stream deposited features. The fold-out near the rear of the guide shows the ball-and-pillow structures at this locality (from Irwin, 1970). Zones of ball-and-pillow structures are common in the Devonian Greenland Gap Group (=Chemung) of the Valley and Ridge Province and in the Mississippian Berea Sandstone of Ohio.

limestone, fresh water, gray, dense	1 ft.
Little Pittsburgh Coal interval - carbonaceous shale	1 in.
Little Pittsburgh Limestone - gray to pink, fresh water, brecciated to conglomeratic limestone, with gray to purple shales.	9 ft.

This section continues westward along highway 2 to include the upper half of the Conemaugh Formation.

29.2 .1 Recent rockfall of cross-bedded light gray sandstones. The Upper Sewickley Sandstone of the Monongahela Formation near the summit of the hill is the youngest distinctive unit along this highway cut.

Sketch prepared from photographs showing a portion of the disturbed zone in an outcrop of the Monongahela Formation 2.1 miles west of St. Marys, West Virginia on West Virginia Highway 2.



3
2
1
0
0 1 2 3
Approximate horizontal and vertical scale in meters

B-1→ Sample location

Upper Pittsburgh Sandstone Member of the Monongahela Formation

Claystone in the Monongahela Formation

Covered by road or by talus

Bedding surfaces determined from cross-bed sets

30.1 .9 Enter St. Marys. The pilings of the old Hy Carpenter Bridge across the Ohio River are visible to the left. The bridge was dismantled because it was of the same type as the Silver Bridge that collapsed at Pt. Pleasant, W. Va. A new bridge will be constructed in about 3 years but at the present time a ferry is used to move the traffic across the river.

30.7 .6 Turn left on detour and turn right on highway 2 at the stop light.

31.3 .6 Turn right on 50-A and 16. Ascend a hill with exposures of nonmarine sandstones, shales, and coals that are a part of the Pennsylvanian Monongahela Formation.

31.9 .6 LUNCH STOP 5 - Turn right into the roadside park and enjoy cool Kentucky fried chicken and perhaps some delicious slaw.

The following is a measured section modified from Cross and Schemel (1956, p. 70) along highway 50-A from the margin of the floodplain at St. Marys (elevation 700 feet) to near the summit of the hill (elevation 1050 feet). The turnoff into the park is at an elevation of about 880 feet. The upper part of the Monongahela Formation and the Washington Formation are exposed.

Dunkard Group, Washington Formation	
Upper Middle Marietta Sandstone - upper 10 ft. consists of gray sandstone with shaly siltstone. Middle 15 ft. has gray very massive sandstone. Lower 8 ft. with olive-gray shaly siltstone and some limestones.	33 ft.
Washington "A" Coal interval - 1018 ft. of elevation	
shale, red	4 ft.
concealed	6 ft.
siltstone, brown	3 ft.
concealed	14 ft.
Lower Marietta Sandstone - brown massive sandstone with clay pellets near the base.	26 ft.
shale	1 ft.
Washington Coal - bituminous, 966 ft. of elevation	1 ft.
shale, gray	9 ft.
siltstone with numerous limestone nodules	3 ft.
Mannington Sandstone - brown siltstone and sandstone	22 ft.
concealed	30 ft.
sandstone, brown	6 ft.
concealed	22 ft.
sandstone, brown, massive	5 ft.

		siltstone or shaly sandstone that becomes sandier upward	5 ft.
		Washington Formation	
		Monongahela Formation	
		Waynesburg Coal interval - gray shale	1 ft.
		shale, red, non-bedded	8 ft.
		shale, yellow to gray with a 4 inch sandstone ledge	10 ft.
		Gilboy Sandstone? - sandstone and shale in upper part, massive gray 6 ft. sandstone in lower part with an undulatory base	13 ft.
		Little Waynesburg Coal interval - 872 ft. of elevation	
		shale or argillaceous limestone, gray, calcareous with 4 ft. of shale at the top	12 ft.
		siltstone, gray with some shale	6 ft.
		shale, red, poorly bedded	5 ft.
		shale, gray and red in the middle with limestone nodules	5 ft.
		siltstone, yellow to brown	3 ft.
		shale, gray, thick bedded	4 ft.
		Uniontown Coal interval? - gray shale	4 in.
		limestone, argillaceous, yellow	1 ft.
		shale, red with carbonaceous streaks	5 ft.
		limestone, argillaceous	9 ft.
		Lower Uniontown Sandstone - gray, very massive sandstone with an undulatory base	27 ft.
		shale, gray	6 ft.
		Lower Uniontown Coal interval - 743 ft. of elevation carbonaceous shale	2 in.
		limestone, gray, argillaceous	6 ft.
		Benwood - shale, calcareous, weathers deep red, with limestone nodules	26 ft.
		Upper Sewickley Sandstone - brown fine grained sandstone	10 ft.

After lunch turn right on 50-A and 16 and drive uphill. Exposures of the Pennsylvanian-Permian Dunkard Group will be passed for the next 23 miles.

40.1	8.2	Enter Ritchie County
41.3	1.2	Enter the town of Finch.
41.7	.4	Leave the town of Finch.
43.6	1.9	Town of Pike. Stop at the stop sign and turn right onto old highway 50.
55.0	11.4	Pass Nutter Farm and turn left over bridge.

55.2 .2 Stop and turn right on four lane highway 50.

56.9 1.7 Sedimentary rocks in the road cuts are on the eastern flank of the Burning Springs Anticline.

57.7 .8 STOP 6 - Park along the right side of the highway.

The sedimentary rocks are dipping eastward on the flank of the Burning Springs Anticline. At this locality we can walk through several million years of Pennsylvanian sedimentation. The section reveals the upper one-third of the Allegheny Formation and over three-fourths of the overlying Conemaugh Formation. At least four marine transgressions are preserved as the Brush Creek, Cambridge, Ames, and Gaysport Members. Several of the units are probably lacustrine, but the major fresh water limestones in the section are the Upper Freeport and the Elk Lick Members.

Monongahela Formation - Redstone fresh water limestones are exposed along old highway 50 east of the gully.

Conemaugh Formation

Lower Connellsville Sandstone - brown to gray sandstone exposed to the edge of a large gully.	35 ft.
gray shale	2 ft.
Normantown Coal - bituminous	1 ft.
Clarksburg - red brown soft shales with numerous recent slides	30 ft.
Morgantown Sandstone - gray green massive appearing cross-bedded sandstone with some thin shales near the top.	35 ft.
Elk Lick Limestone - fresh water, brecciated, mud-cracked light gray limestone - 1 ft., with overlying shale	
Birmingham - soft red-brown shale with recent slump structures	80 ft.
Upper Grafton Sandstone - gray sandstone and shale with a covered Skelly marine limestone and Duquesne Coal interval. The Skelly is the youngest marine limestone in the states of Ohio and West Virginia, and represents the last of the preserved marine invasion across the delta plains.	25 ft.
Gaysport Limestone - marine gray dense limestone layer	2 in.
Grafton Sandstone - gray sandy shale	4 ft.
Ames Limestone - marine, crinoidal, gray limestone and associated gray shale. Neochonetes brachiopods are abundant in the shales. Others would include Neospirifer, large Productids like Juresania, with bryozoa, crinoid stems and calyx plates. (The Ames and younger rocks through the Lower Connellsville are better exposed on the south side of the highway)	1 ft.

	Lower Grafton Sandstone - gray sandstone	5 ft.
	Harlem Coal - bituminous	4 in.
	Pittsburgh Red Beds - red-brown shales with ironstone concretions. Many concretions have well preserved carbonized Neuropteris leaves	60 ft.
	Saltsburg (or Cow Run) Sandstone - light gray sandstone with carbonized plant pieces interbedded with some shales. Interval includes the Bakerstown Coal	20 ft.
	Cambridge Limestone - two layers of gray limestone each about one foot thick separated by three feet of gray shale. Large brachiopods such as Linoproductus and Juresania-like productids are present.	5 ft.
	shale - gray	20 ft.
	Wilgus Coal - bituminous	6 in.
	Buffalo Sandstone - gray to brown sandstone with gray to black shale	15 ft.
	covered interval. The marine Brush Creek black shale can be seen on the opposite (south) side of the highway along a side road. Some of the shales have brachiopods and gastropods, but a better collecting site is on the western side of the anticline and south of the highway.	
	Mahoning Sandstone - gray sandstone	40 ft.
	Conemaugh Formation	
	Allegheny Formation	
	Upper Freeport Coal - bituminous	2 ft.
	shaly interval	20 ft.
	Upper Freeport Limestone - nodular red-brown limestone with gray shale. The unit is a massive limestone on the west side of the anticline	2 ft.
	shale	5 ft.
	Upper Freeport Sandstone - gray to brown sandstone	20 ft.
	Lower Freeport Coal - bituminous, 1 inch thick that is 1-2 ft. below the sandstone. The coal increases to one foot in thickness on the western side of the anticline.	
	Mainly a covered interval from here to near the crest of the highway.	

58.3 .6 STOP 7 - Park along the right side of the highway in the vicinity of the Ritchie-Wood County line.

The Sand Hill road cut exposes rocks that are along the axial trace of the Burning Springs Anticline. The brown sandstones change in thickness as they are traced along the western flank of the anticline with few key units being evident in the section.

The following section may be examined in the future by driving about 1.4 miles west of the summit, turn left at Borland Springs Road, and drive about ½ mile east to the end of an abandoned section of old highway 50. The steeply tilted rocks on the western flank of the anticline are exposed in a gully that parallels the new highway 50.

Conemaugh Formation

Brush Creek - marine, black shale with most of the fossils located in the upper half. Near the top there is a 1-2 foot black limestone layer with many white fossils. The fossils are primarily mollusks, and include gastropods such as Bellerophon (Pharkidonotus), Bellerophon (Bellerophon), Straparolus, Glabrocingulum, Meekospira, with pelecypods (Astartella), cephalopods (Metacoceras), brachiopods (Kozlowskia, Chonetinella, Juresania), and horn corals (Lophophyllidium or Stereostylus). The rocks dip about 70° west.	20 ft.
Brush Creek Coal - bituminous	8 in.
gray shale	30 ft.
Mahoning Sandstone - gray sandstone beds with some gray to green shales. A 4 foot black fissile shale occurs near the base.	60 ft.

Conemaugh Formation

Allegheny Formation

Upper Freeport Coal - bituminous	2 ft.
gray shale and some sandstone	20 ft.
Upper Freeport Limestone - gray, dense, massive limestone	2 ft.
Upper Freeport Sandstone - gray thin bedded sandstone and shale	75 ft.
Lower Freeport Coal - bituminous	1 ft.
Lower Freeprot Sandstone - gray to brown cross-bedded sandstone	25 ft.
Upper Kittanning Coal - a trace in black and gray shale	
Upper East Lynn Sandstone - partly covered sandstone and shale that weathers to a red-brown soil	130 ft.
Middle Kittanning Coal - bituminous	2 ft.
East Lynn Sandstone - gray, massive appearing sandstone	25 ft.
Lower Kittanning Coal - bituminous	2-3 ft.
Clarion Sandstone - gray sandstone and shale	45 ft.
Clarion Coal - bituminous	1 ft.

Allegheny Formation

Pottsville Formation

Homewood Sandstone - massive gray to brown cross-bedded sandstones. This is the thickest unit of sandstone in the section 100 ft.

Underlying shales and sandstones with very gentle dips are exposed to the east end of the stream.

59.7	1.4	Borland Springs Road.
50.2	.5	Horizontal sedimentary rocks west of the Burning Springs Anticline.
61.8	1.6	Highway 31 junction. STAY ON U.S. 50.
65.8	4.0	Prominent sandstone in the Dunkard Group on the left with an undulatory erosional base. Numerous road cuts reveal much cut-and-fill structure. Many of the stream deposited sandstones pinch out as they are traced along the exposures. Recent slumps are common.
72.7	6.9	Drive under Interstate 77. CAUTION! Four lane highway 50 narrows into two lanes.
73.6	.9	Enter Parkersburg, West Virginia. Wiggle through the city on highway 50 and remain in the right lane.
76.4	2.8	Junction of highway 50-14-2. Remain on 50.
76.6	.2	Turn right on highway 50, leave Parkersburg, cross the Ohio River bridge (note the depressions before your tires find them) and enter Ohio. Barge explosion site with railroad bridge repair in progress.
77.1	.5	Stop light in Belpre, Ohio at the end of the bridge. Continue straight on highway 50.
77.9	.8	Turn left on highway 50 at the northern end of Belpre, and merge with the traffic into the <u>right</u> lane.
78.5	.6	Turn right onto Clement Avenue.
78.8	.3	Make a sharp right turn off Clement Avenue.
80.0	.2	STOP 8 - (If the caravan is too enormous we will park at the Memorial Motel). Follow the leaders and ascend a path to a Dunkard vertebrate locality.

The nonmarine red-brown to gray strata of the Dunkard Group were exposed in 1965 by construction crews that utilized the rocks as fill for the new section of highway 7. The most interesting unit is a 2 foot stream deposited gray to red-brown pebble conglomerate positioned about one-third the way up the cliff. This conglomerate, located in the upper part of the Washington Formation, extends laterally for about 2000 feet and has over 15 genera of

vertebrates. A tentative faunal list is as follows:

Superclass Pisces

Class Chondrichthyes (~~shales~~ sharks)

Genus Ctenacanthus

Genus Xenacanthus

Class Osteichthyes (bony fish)

Genus Sagenodus (lungfish)

Genus Ectosteorhachis (coelecanth)

Genus Elonichthys? (scales found in coprolites)

Superclass Tetrapods

Class Amphibia

Genus Eryops

Genus Cacops or Aspidosaurus

Genus Megamolgophis

Genus Diploceraspis

Genus Diadectes

Genus Lysorophus

Class Reptilia

Genus Edaphosaurus

Genus Dimetrodon

undetermined pelycosaurs and ophiacodonts

Coprolites derived from fishes, amphibians, and reptiles.

Some of the animals had not been reported previously from the Dunkard Group, but were known to occur in the Lower Permian of the southwestern part of the United States. This site known as the Belpre locality will no doubt eventually produce more water and land dwelling vertebrates than are listed above.

As is typical of most vertebrates found in stream deposits, the skeletons are disarticulated. Small individual whole bones and well rounded stream worn fragments are the most common types found weathered from the conglomerate or within the rock. Only two forms may be considered as being abundant at the Belpre locality. Pleuracanth shark teeth with two sharp projections extending from a base or root should be found by everyone in the group. The teeth that are about $1\frac{1}{2}$ inches in length are assigned to Genus Xenacanthus by some vertebrate paleontologists. Edaphosaurus, the plant eating sail fin reptile, is represented primarily by water worn pieces of

the neural spines that extended dorsally from its back to support the fin. These pieces will have rounded lateral knobs or projections. Additional information and pictures of some of the animals may be found in Hlavin (1968).

80.2 .2 Turn the cars around and turn left onto Clement Avenue.

80.5 .3 Stop and turn left onto highway 50. Remain in the left lane.

80.7 .2 The left lane veers to the left and joins highway 7. The extensive exposures you just examined are to your left.

84.4 3.7 Numerous recent slumps in the Dunkard Group on your left. The Ohio River is obviously to your right, unless you're facing backwards.

84.9 .5 Abandoned grindstone company on your left.

85.6 .7 Salt from the large piles to your right are placed on the streets of Marietta during the snowy winter months.

86.9 1.3 On the left are two large sand and gravel pits. The Ohio River deposits have well developed festoon (trough) cross-bedding.

88.0 1.1 Union Carbide buildings on both sides of highway 7. Hold your breath as long as possible!

89.4 1.4 Cross railroad tracks.

89.5 .1 Stream deposited sandstone of the Lower Marietta Member, Washington Formation, Dunkard Group on your left.

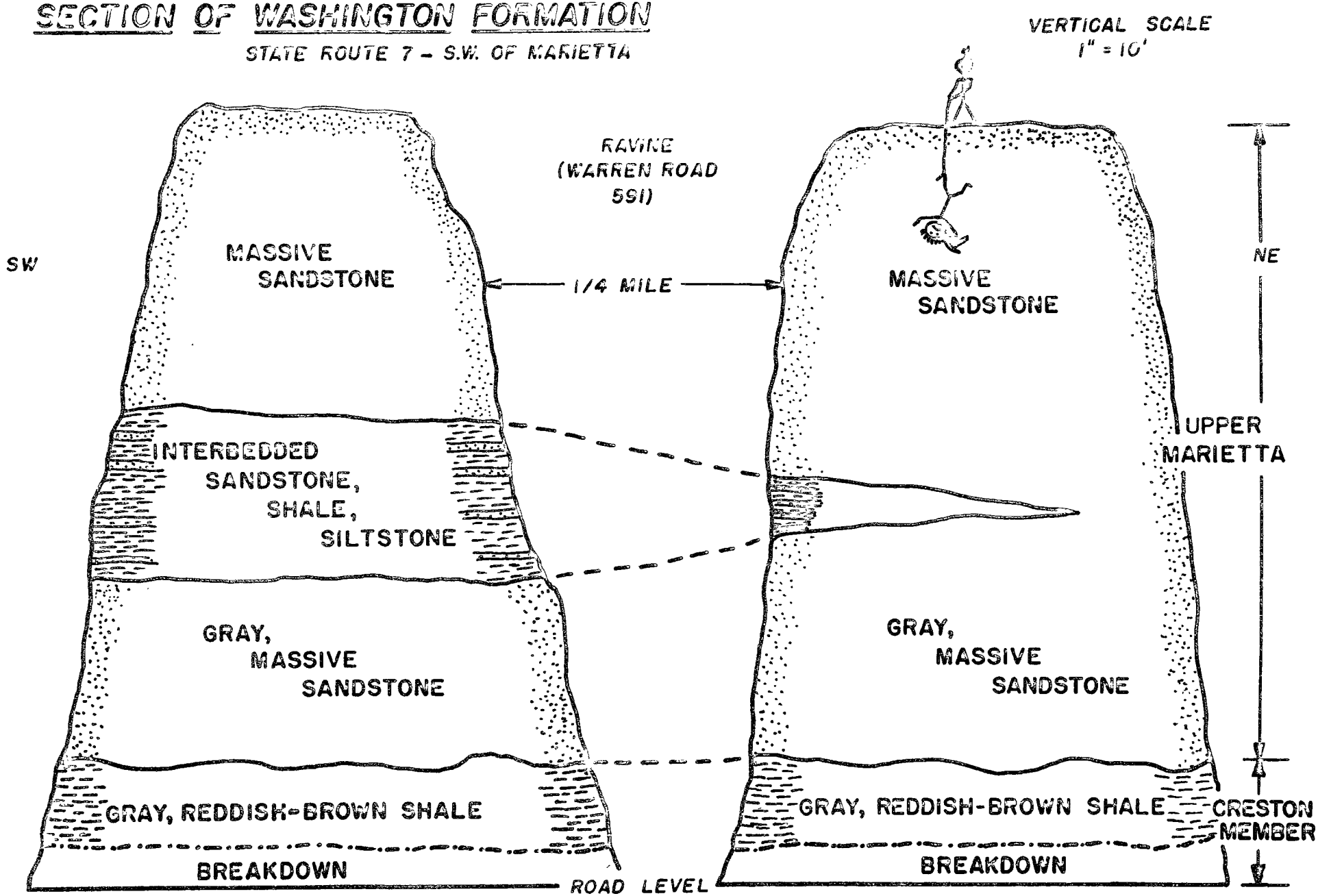
90.0 .5 Lower Marietta Member on your right.

90.8 .8 STOP 7 - Turn right at the Scenic View sign and park.

The extensive exposure on the north side of the highway reveals rocks of the Pennsylvanian-Permian Washington Formation, Dunkard Group. Redbeds at the base represent the Creston Member. These floodplain deposits have some carbonized plants and rare vertebrate remains. The holotype skull of an amphibian was collected from the upper part of the shale at this locality (Olson, 1970). The cliff is composed of about 50 feet of cross-bedded stream deposited brown sandstone that represents the Upper Marietta Member. A small tongue of shale and siltstone appears on the left side of the longest exposure. West of the ravine and side road the tongue becomes thicker and divides the Upper Marietta into two distinct sand bodies (see the diagram on the next page). Nonmarine members within the Pennsylvanian and Permian Systems of Ohio and West Virginia are most difficult to trace from one locality to another as the present exposures clearly indicate.

SECTION OF WASHINGTON FORMATION

STATE ROUTE 7 – S.W. OF MARIETTA



This stop terminates the 1972 Ohio Academy of Science Geology Field Trip. If you desire to return to Marietta College, the road log continues.

92.2 1.4 Enter Marietta.

93.1 .9 Cross the Muskingum River and continue through the traffic lights.

93.5 .4 Turn right on Fourth Street and drive 0.6 mile to Marietta College.

94.1

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